



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Ch

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,599	11/24/2003	Paul Rothman	CC-0681	5042

7590 04/20/2005

Robert D. Crawford
CiDRA Corporation
50 Barnes Park North
Wallingford, CT 06492

EXAMINER

KHUU, HIEN DIEU THI

ART UNIT PAPER NUMBER

2863

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/720,599	Applicant(s) ROTHMAN ET AL.	
	Examiner Cindy D. Khuu	Art Unit 2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>04/04/05</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Specification Objections

The disclosure is objected to because of the following informalities:

On page 10, lines 22-23 the reference to $V_c(t)$ should be change to $U_c(t)$ (e.g. Figure 3) to maintain consistency with the specification and drawings.

On page 12, line 19 the reference to 14.2 ft/sec should be 14 ft/sec (Figure 4) to maintain consistency with the drawing.

Appropriate correction is required.

Drawing Objections

Figure 8(b) is objected to under 37 CFR 1.83(a) because it fails to show Array Gain Plot as described in the specification (Page 15: Line 1). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing (MPEP 608.02(d)).

Correction is required.

Claim Objections

Claim 12 is objected to because of what appears to be a typographical error. It would appear that the dependency, "A flow meter according to claim 1" should be "A flow meter according to claim 11".

The examination and art rejections below treat claim 12 as though the dependency is claim 11.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

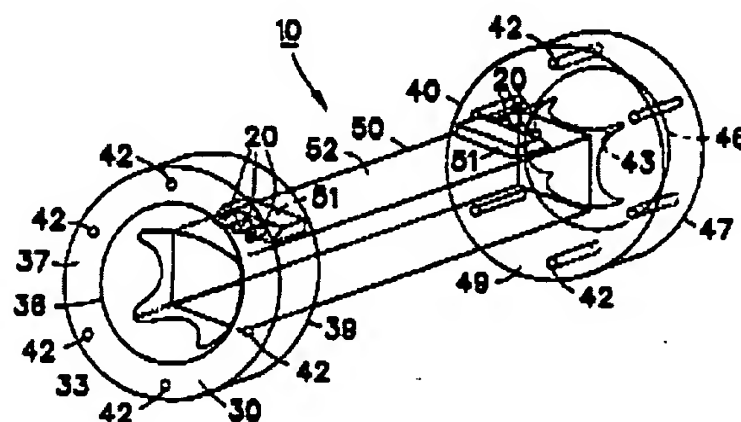
(e) The invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

Art Unit: 2863

granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3,5-6,10 and 11-13,15-16,20 are rejected under 35 U.S.C. 102(b) as being anticipated by Baumoel (6,026,693).

With respect to claim 1 and 11, Baumoel discloses a method and apparatus for calibrating a flow meter having an array of sensors arranged in relation to a pipe that measures a flow rate of a fluid flowing in the pipe (Column 3: Lines 9-11, 29-42), characterized in that the method comprises the step of calibrating the flow rate using a calibration correction function based on one or more parameters that characterize either the array of sensors (Column 9: Lines 15-27), the pipe (Column 1: Lines 55-57; Column 9: Lines 48-54; Column 12: Lines 35-54), the fluid flowing in the pipe (Column 9: Lines 39-45), or some combination thereof.



With respect to claims 2 and 12, Baumoel further discloses a method and apparatus, wherein the calibration correction function depends on either a ratio t/D of the pipe wall thickness (t) and the pipe inner diameter (D); a Reynolds number ($\rho U D / \mu$) that characterizes the fluid flow in the pipe (Column 1: Lines 49-62; Column 9: lines 41-42); a ratio $\Delta x / D$ of the sensor spacing (Δx) and the pipe inner diameter (D); a ratio $f \Delta x / U_{\text{meas}}$ of usable frequencies in relation to the sensor spacing (Δx) and the raw flow rate (U_{meas}); or some combination thereof.

With respect to claims 3 and 13, Baumoel further discloses a method and apparatus, wherein the flow rate is a volumetric flow rate (Q) and the method includes the step of determining the volumetric flow rate (Q) based on the equation:

$$Q = A * U_{\text{av}},$$

where A is a cross sectional area of the pipe's inner diameter and U_{av} is an average flow velocity (Column 1: Lines 7-58; Column 2: Lines 49-51; Column 3: Lines 29-42; Column 6: Lines 66-67; Column 7: Lines 1-19).

With respect to claims 5 and 15, Baumoel further discloses a method and apparatus, wherein the Reynolds number $\rho U D / \mu$ is defined by a ratio of the fluid density (ρ), the

Art Unit: 2863

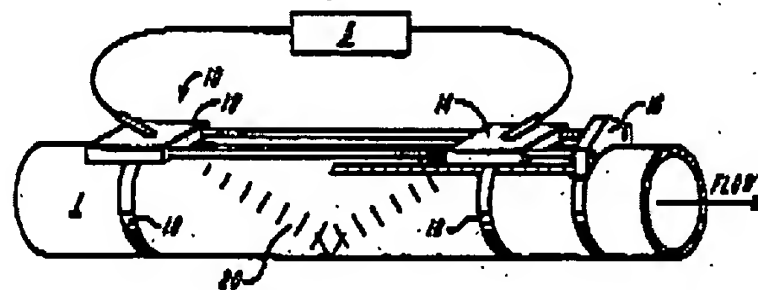
volumetrically averaged flow velocity (U) and the pipe inner diameter (D) in relation to the dynamic viscosity of the fluid (μ) (Column 1: Lines 49-62; Column 9: Lines 38-44).

With respect to claims 6 and 16, Baumoel further discloses a method and apparatus, wherein the flow rate includes the velocity of flow (Column 1: Lines 11-31).

With respect to claim 10 and 20, Baumoel further discloses a method and apparatus, wherein the method includes the step of receiving as inputs the one or more parameters (Column 9: Lines 27-33).

Claims 1,6,8-9,11, 16, 18 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Lynnworth (5,179,862).

With respect to claims 1 and 11, Lynnworth discloses a method and apparatus for calibrating a flow meter having an array of sensors arranged in relation to a pipe that measures a flow rate of a fluid flowing in the pipe (Column 1: Lines 4-20), characterized in that the method comprises the step of calibrating the flow rate using a calibration correction function based on one or more parameters that characterize either the array of sensors (Column 1: Lines 20-68), the pipe (Column 1: Lines 20-68), the fluid flowing in the pipe (Column 1: Lines 20-68), or some combination thereof.



With respect to claims 6 and 16, Lynnworth further discloses a method and apparatus, wherein the flow rate includes the velocity of flow (Column 1: Lines 4-68).

With respect to claims 8,9, 18 and 19, Lynnworth further discloses a method and apparatus, wherein the array of sensors includes an array of pressure sensors, strain or temperature sensors (Column 6: Lines 16-33).

Claims 1, 11, 9, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Gimson (US 2004/0149027).

With respect to claim 1 and 11, Gimson discloses a method and apparatus for calibrating a flow meter having an array of sensors arranged in relation to a pipe that measures a flow rate of a fluid flowing in the pipe (Page 1: Paragraph 1; Page 3: Paragraph 40), characterized in that the method comprises the step of calibrating the flow rate using a calibration correction function based on one or more parameters that characterize either the array of sensors (Page 1: Paragraph 8; Page 2: Paragraph 14),

Art Unit: 2863

the pipe (Page 1: Paragraph 5-6), the fluid flowing in the pipe (Page 1: Paragraph 8), or some combination thereof.

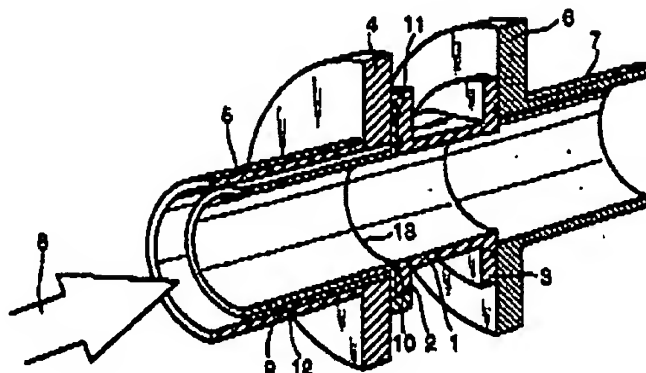


Fig. 1

With respect to claim 9 and 19, Gimson further discloses a method and apparatus, wherein the array of sensors includes an array of strain or temperature sensors (Page 2: Paragraph 14).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4, 14, 7, 17, 8, 18, are rejected under 35 U.S.C. 103(a) as being unpatentable over Baumoel (6,026,693) in view of Fernald (US 2004/0168522).

Baumoel teaches all the claimed limitations as discussed above except for:

Regarding to claims 4 and 14, the method includes the step of determining the average flow velocity (U_{av}) based on the equation:

$$U_{av} = \text{the calibration correction function} * U_{meas},$$

where U_{meas} is a measured flow rate.

Regarding to claims 7 and 17, the velocity of flow is determined by using a K- ω plot.

Regarding to claims 8 and 18, the array of sensors includes an array of pressure sensors.

However, Fernald teaches the following:

Art Unit: 2863

Regarding to claims 4 and 14, the method includes the step of determining the average flow velocity (U_{av}) based on the equation:

$U_{av} = \text{the calibration correction function} * U_{meas},$
where U_{meas} is a measured flow rate (Page 8: Paragraphs 104-108).

Regarding to claims 7 and 17, the velocity of flow is determined by using a K- ω plot (Page 10: Paragraphs 120-124).

Regarding to claims 8 and 18, the array of sensors includes an array of pressure sensors (Page 2: Paragraphs 12-13).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide Baumel with the equation the Average Flow Velocity (U_{av}) = the calibration correction function * U_{meas} as disclosed by Fernald for the purpose of determining a Volumetric Flow Rate (Q) of the flow in a pipe when the value of Average Flow Velocity (U_{av}) is not readily provided for. Baumel teaches the average flow velocity but does not teach how to determine it. Fernald provides the necessary formula that is missing from Baumel to compute the average velocity.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide Baumel with the teachings to determine the velocity of flow by using a method K- ω plot as disclosed by Fernald for the purpose of determining the flow rate within a pipe. Baumel teaches the velocity of flow but does not teach how to determine it by using a K- ω plot method. Fernald provides the method, which is missing from Baumel to compute the velocity of flow.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide Baumel with the teachings to incorporate an array of pressure sensors as disclosed by Fernald for the purpose of determining the pressure indication within a pipe. Baumel teaches of a flow meter having an array of sensors but does not teach to incorporate an array of pressure sensors as disclosed by Fernald.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following is cited to further show the state of art with respect to methods and apparatus in general for determining flow rate of a fluid flowing in a pipe:

U.S. Patent No. 4,754,641 to Orban et al. discloses a method and apparatus for measurement of fluid flow; U.S. Patent No. 4,965,756 to Pearman et al. discloses a method and apparatus for calibration of electronic gas meters; U.S. Patent No. 3,895,529 to Moore discloses a flowmeter compensating system; U.S. Patent No. 5,063,776 to Zanker et al. discloses a method and system for measurement of fluid flow

Art Unit: 2863

in a drilling rig return line; U.S. Patent No. 4,856,321 to Smalling et al. discloses a method and apparatus for measuring fluid flow parameters; and U.S. Patent No. 4,961,348 to Bonne discloses a flowmeter fluid composition correction.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cindy D. Khuu whose telephone number is (571) 272-8585. The examiner can normally be reached on M-F, 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CHB 04/04/05



John Barlow
Supervisory Patent Examiner
Technology Center 2800